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ENGINEERING SERVICE CENTER  
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## METHOD FOR DETERMINATING MOISTURE CONTENT BY OVEN DRYING

**CAUTION:** Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read “**SAFETY AND HEALTH**” in Section F of this method. It is the responsibility of whoever uses this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

### A. SCOPE

This test is used to determine the water content of a materials by drying a sample to constant mass at a specified temperature. The water content of a given soil is defined as the ratio, expressed as a percentage, of the mass of the pore water to the mass of the solid material (or "solids").

### B. APPARATUS

1. Weighing device: A balance or scale sensitive to 0.1 % of the mass of the test sample, and having a capacity equal to, or greater than, the wet mass of the sample to be tested.
2. Drying device: An oven or other suitable thermostatically controlled heating chamber capable of maintaining a temperature of  $110 \pm 5^{\circ}\text{C}$ .
3. Containers: Any pan or other container, that will not be affected by the drying temperature, and is suitable for retaining the test sample without loss while permitting the water to evaporate.

NOTE: A broad shallow pan is normally most suitable for promoting drying; however, containers with moisture-tight covers are

required when the mass of the test samples are not determined immediately after preparation or after cooling following the drying period.

### C. TEST PROCEDURE

1. Prepare a representative portion of the material to be tested.

- a. Unless other amounts are specified, the following minimum test sample sizes are suggested.

	Material	Minimum Sample Size
(1)	Soil	100 g
(2)	Fine Aggregate – nominal maximum size of 9.5 mm or smaller	500 g
(3)	Coarse Aggregate – maximum particle size larger than 9.5 mm sieve.	1000 g
(4)	Miscellaneous Materials (straw, chips, etc.)	Sufficient bulk to be representative

- b. When testing lightweight, bulky materials, such as straw, hand pack a substantial amount of material into a suitable container having a capacity of approximately 3.8 L.

2. Determine the mass of the test sample and record this mass as the "wet mass".

- a. The most convenient procedure for determining the mass of the sample before and after drying is to place it in a tared container where it will remain throughout the test. The mass of the container and sample are determined and the mass of the container subtracted.

- b. If the mass of the test sample is not determined immediately after preparation, place the moisture-tight cover on the container to prevent evaporation.

3. Dry to constant mass at  $110 \pm 5^{\circ}\text{C}$ .

- a. The drying time required to achieve constant mass will vary depending on the type, quantity, and condition of the material. In most cases, an overnight (16 h) drying period is sufficient. Large clay lumps may require significantly longer drying periods.

- b. To reduce the drying time, break lumps of material into small fragments and spread in a thin layer over the bottom of the containers. Position the containers in the drying device to allow the maximum air circulation and exhaust of the moisture laden air.

- c. Constant mass has been achieved when less than 0.1 % of the test sample wet mass is lost during an additional exposure to the drying process. Subsequent drying periods to verify constant mass shall be of at least 1 h duration.

- d. Verification of constant mass will not be necessary for each sample, provided the drying time exceeds the minimum time established for similar materials and conditions in the same drying device.

4. Remove the sample from the drying device and cool to room temperature.

NOTE: If the mass of the test sample is not determined immediately after cooling, place the moisture-tight cover on the container to prevent absorption of moisture from the air.

5. Determine the mass of the test sample and record this weight as the "dry mass".

#### D. CALIBRATION

Determine the moisture content of the test sample as follows:

1. Mass of water in sample = wet mass minus dry mass

2. Percent moisture =

$$\frac{\text{Mass of Water}}{\text{Dry Mass of Sample}} \times 100$$

#### E. PRECAUTIONS

The drying rate of test samples will be affected by the moisture conditions and number of samples in the drying device. When wet samples are placed in the drying device with nearly dry samples, completion of the drying may be restarted.

#### F. SAFETY AND HEALTH

Soils and aggregates may contain bacteria and/or organisms which can be harmful to one's health. Wearing dust masks and protective gloves when handling materials is advised.

The use of heat resistant gloves/mitts or pot holders to remove samples from the ovens is recommended.

Prior to handling, testing or disposing of any waste materials, testers are required to read: Part A (Section 5.0), Part B (Sections: 5.0, 6.0, 10.0 and 12.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual. Users of this method do so at their own risk.

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